

Vacuum System Reliability

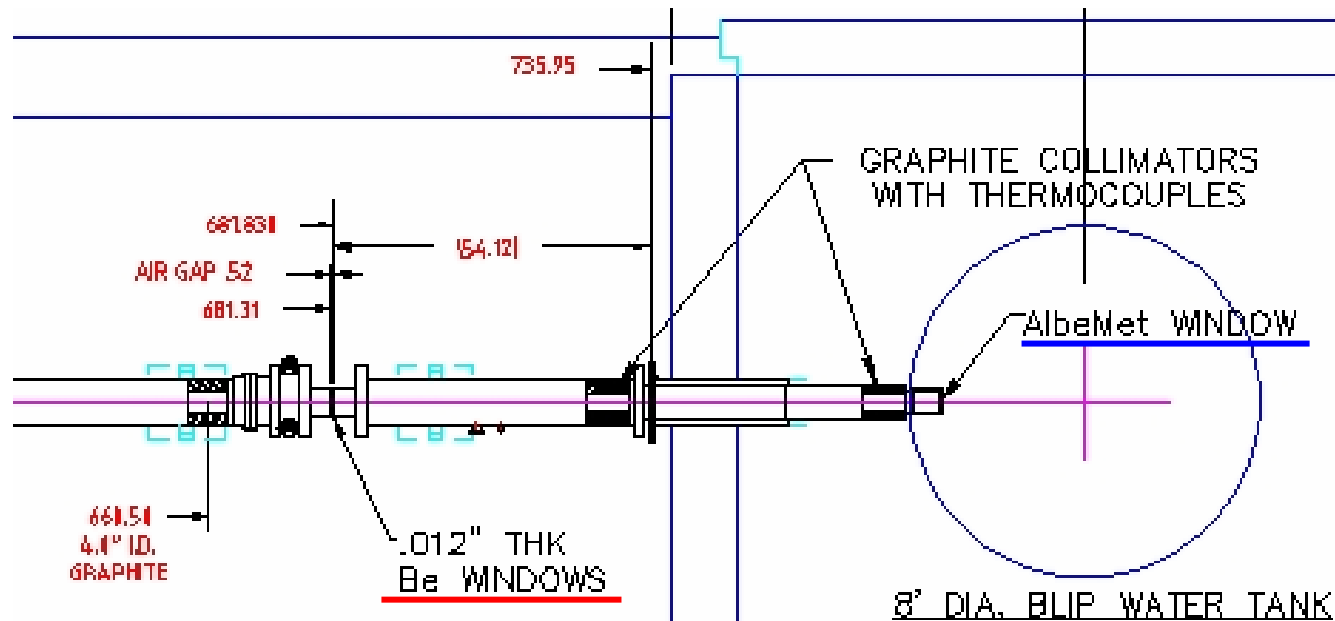
H.C. Hseuh

July 11, 2006

- Overall - vacuum has few hours of down time
 - No recorded failure hours from 3/10 - 5/17
- BLIP and Linac
 - Linac pump trips; BLIP window
- Booster
 - IG filaments, power dip recovery
- AGS
 - IPPS trips, IPC upgrade, IPM
- RHIC
 - Beam shutters for PASS
 - CCG sensors
 - PLC co-processors hung
 - Radiation damage to tunnel TMP and GC
 - Insulating vacuum helium leaks

Linac and BLIP

- Linac and HEBT ion pump trips and valve closures
 - Several time in Run-6, recovery was handled by Linac staff
 - Should HEBT IPCs (and TMP) transferred to Linac in 2007, or remain in A10?
- BLIP window - leaked several times in Run-4 and Run-5
 - Installed 7" graphite collimators w/ TC in Run-6
 - Interlock beam at 80C (200 MeV) and 165C (117 MeV)
 - **Al/Be window** (replacing Al window) has not failed this year
 - Estimated window T at **117 MeV ~ 500C**
 - **BLIP wants to eliminate two Be windows?** \Rightarrow common vacuum to HEBT-A and Linac
 - To improve beam profile on targets



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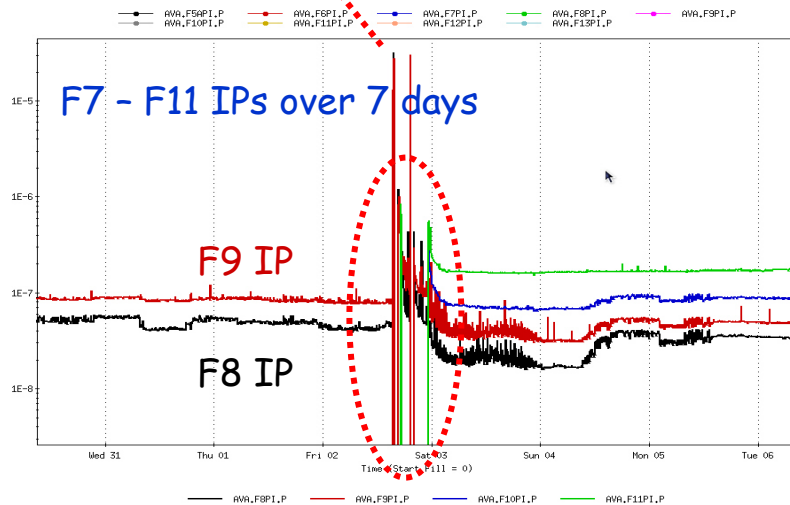
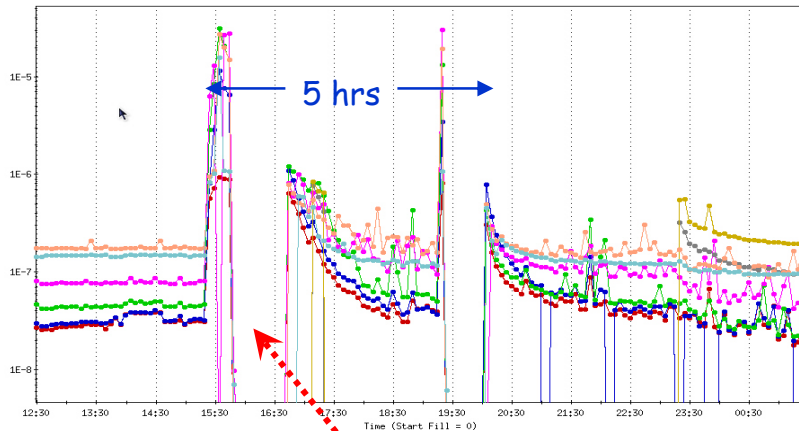
Vacuum Reliability

Booster Vacuum

- IG filament tripped and caused valve closures
 - 3 of 44 IGs with both filaments broken
 - ~ 3 more IGs with one filament left
- Slow recovery from major power dips
 - Long lag time to reopen sector valves
 - Slow compressor? water in compressed air?
 - (to be investigated this summer)
 - Revise PLC code to add **time stamps** on PLC and 'pet' to distinguish real valve faults from disrupted communication
- Booster B sector on June 3rd
 - Pressure increased rapidly to **2e-7 Torr**, no valves closed
 - Coincided with **B5 ion pump** V & I oscillation and trip
 - Two gauges were found at degas mode
 - ADO code revised to remove remote degas capability
 - System recovered by itself after 18 hours? Why?
 - Being investigated this shutdown

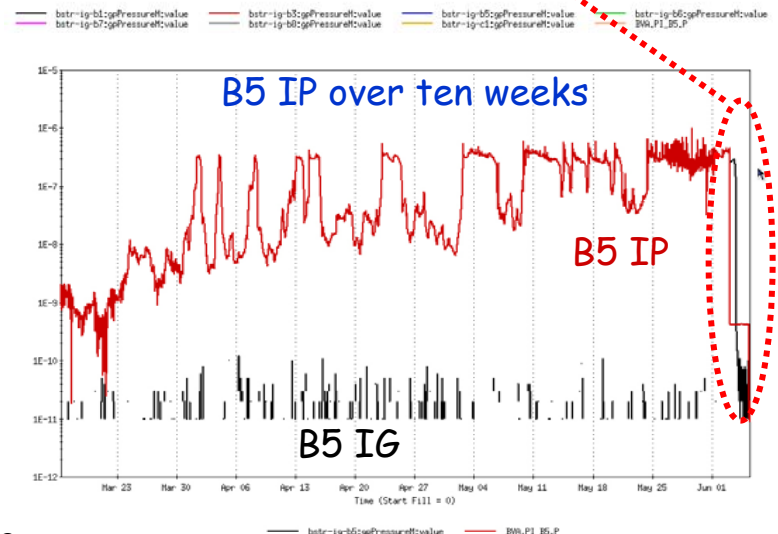
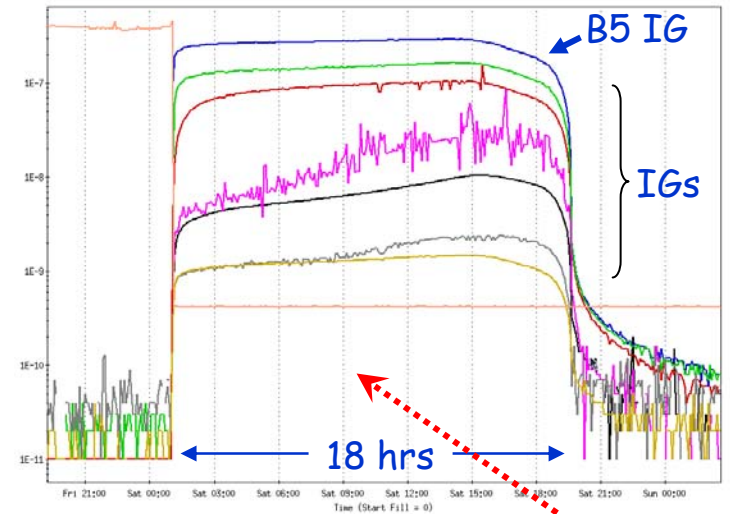
AGS Superperiod F Fri. June 2nd, 3pm - 8pm

Peaked around F9 (bad IPPS?)
@ 3.3 kV instead of 5 kV
Recovered after roughing with TMP



Booster Sector B Sat. June 3rd, 1am - 7pm

Centered at B5
HV feedthru?



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RHIC Retreat 2006
Vacuum Reliability

AGS Vacuum

- Ion pump power supplies tripped and closed sector valves
 - i.e. **F sector on June 2nd** took ~ 6 hrs to recover
 - In-house designed IPPS, ~ **170 dual units** (Booster + AGS)
 - Legacy Datacon communication problems ⇒ No remote monitoring
 - Being replaced with commercial units
 - **H10 completed in 2005, E18 work started last month**
 - A10 and Booster - 2007+
 - **F5 kicker and F10 septum** will be removed this summer!
- Ion pump failures adjacent to IPMs at C5 and E15
 - Servo valve failure caused ion pump saturation and overheating
- Turbo control upgrade - development in progress
 - Replace obsolete Datacon system with PLC-based controls
 - ⇒ **Remote operation of TMP**
- Stale valve status on "pet" page
 - Beam stops inserted, after valve closure, while "pet" showed "open"
 - PLC & ADO code updated to include PLC time stamps and showed on "pet"
- **Cable degradation in AGS and Booster - non-UV compatible, radiation**

RHIC

- Beam shutter failures
 - PASS requirement: travel time < 3s
 - Corrosion at solenoids and limiting switches
 - Primary one has internal vibration?
 - Will inspect and refurbish with spare parts this summer
- CCG failures, possibly due to dirty ceramic insulators
 - i.e. Blue rf storage cavity gauges in May (interlocked RF)
 - Some insulating vacuum gauges (alarm but no interlock)
- PLC co-processors hung - ~ once a week
 - Need key-switch reset at service building
 - Mostly at AtR (A-trailer and 1000P, air conditioning?)
 - All data funneled through co-processors, resulted in gaps in logged data
 - Will investigate RS485 to Ethernet interface

RHIC (conti.)

- PLC code revision
 - Simplify valve fault code, add time stamps to 'pet'
- Radiation damage to TMP controllers? (and GC?)
 - 36 TMPs with logic controller for local/remote operation
 - Needed local reset/replacement ~ 10 times in Run-6
 - Radiation damage? UPS battery? Power Dips?
- Dump kicker flange leaks: $\sim 10^{-6}$ scc/s & 10^{-9} Torr
 - Need several months to rework & re-assemble (2007+)
- Insulating vacuum:
 - Valve box 8Y: $> 10^{-2}$ scc/s He leak
 - Failed to locate/repair in 05 shutdown
 - Heat shield lines operated at lower pressure to reduce Q(He)
 - A few 10^{-3} scc/s leaks in cryostats, handled by TMP
 - A few vjr need to be pumped before every cool down
 - Leak rates have not increased over the last few years!